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INTERNATIONAL PRELIMINARY EXAMINATION REPORT
(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 22188/06609		FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)
International application No. PCT/US 03/01351	International filing date (day/month/year) 17.01.2003	Priority date (day/month/year) 18.01.2002
International Patent Classification (IPC) or both national classification and IPC F16K5/06		
Applicant SWAGELOK COMPANY et al.		
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 8 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of 5 sheets.</p>		
<p>3. This report contains indications relating to the following items:</p> <p>I <input checked="" type="checkbox"/> Basis of the opinion</p> <p>II <input type="checkbox"/> Priority</p> <p>III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p>IV <input type="checkbox"/> Lack of unity of invention</p> <p>V <input checked="" type="checkbox"/> Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p>VI <input type="checkbox"/> Certain documents cited</p> <p>VII <input type="checkbox"/> Certain defects in the international application</p> <p>VIII <input type="checkbox"/> Certain observations on the international application</p>		
Date of submission of the demand 20.08.2003		Date of completion of this report 07.04.2004
Name and mailing address of the international preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016		Authorized Officer Lanel, F-B Telephone No. +31 70 340-1978 

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International application No. PCT/US 03/01351

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

1-13 as originally filed

Claims, Numbers

1-37 filed with telefax on 12.02.2004

Drawings, Sheets

1/6-6/6 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
☐ the language of publication of the international application (under Rule 48.3(b)).
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority in written form.
☐ furnished subsequently to this Authority in computer readable form.
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

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5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	2-8,10,15-28,32-37
	No: Claims	1,9,11-14,29-31
Inventive step (IS)	Yes: Claims	32-37
	No: Claims	1-31
Industrial applicability (IA)	Yes: Claims	1-37
	No: Claims	

2. Citations and explanations

see separate sheet

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Reference is made to the following documents:

- D1: US-A-3 192 943 (MOEN ALFRED M) 6 July 1965 (1965-07-06)
- D2: US-A-5 595 206 (SORIA VEGA SERGIO) 21 January 1997 (1997-01-21)
- D3: US-A-5 730 420 (TOW JOHN P) 24 March 1998 (1998-03-24)
- D4: DE 12 02 596 B (WHITEY RESEARCH TOOL CO) 7 October 1965 (1965-10-07)

2. The present application does not meet the requirements of Article 33(1) PCT, because the subject-matter of independent claims 1, 14, 29 and 31 is not novel in the sense of Article 33(2) PCT.

2.1 With reference to independent claim 1:

D1 discloses (cf. figure 4 and description, column 4, lines 27-37) a valve comprising a valve body (10) having a valve cavity (17) therein; a valve element (31) for controlling flow through the valve based on rotational position of the valve element about an axis; and a single piece packing (27) that surrounds the valve element and seals the valve element within the valve cavity; the single piece packing being dimensioned to be installed on the valve element within a room temperature range (since no temperature is mentioned in D1, it is implicit that the assembly is done within room temperature).

2.2 With reference to independent claim 14:

D1 discloses (cf. figure 4 and description, column 4, lines 27-37) a method for assembling a valve comprising the steps of forming a one piece packing (21) adapted to seal a valve element (31) within a valve cavity; and installing the packing onto the valve element within a temperature range for which mechanical properties of the packing are unchanged.

2.3 With reference to independent claim 29:

D1 discloses (cf. figure 4 and description, column 4, lines 27-37) a combination of a valve element (31) and a single piece packing (21) therefore, wherein the packing is installed onto the valve element at room temperature (since no temperature is mentioned in D1, it is implicit that the assembly is done within room temperature).

2.4 With reference to independent claim 31:

D1 discloses (cf. figure 4 and description, column 4, lines 27-37) a valve comprising a valve body (10) having a valve cavity (17) therein; a valve element (31) for controlling flow through the valve based on rotational position of the valve element about an axis; and a packing (21) that surrounds the valve element and seals the valve element within the valve cavity; the valve element comprising a ball (33) and adjacent upper (32) and lower (34) trunnions; the ball having an outer diameter D1 and at least one of the trunnions having an outer diameter D3 : wherein the valve element has a ratio D3/D1 that facilitates assembly of the packing onto the valve element at room temperature.

3. Furthermore, the present application does not meet the requirements of Article 33(1) PCT, because the subject-matter of independent claims 17 and 24 does not involve an inventive step in the sense of Article 33(3) PCT.

3.1 With reference to independent claim 17:

- 3.1.1 Document D1, which is considered to represent the most relevant state of the art, discloses a valve from which the subject-matter of claim 17 differs in that the ratio D3/D1 is explicitly about 0.7 to about 0.9. The subject-matter of independent claim 17 is therefore novel (Article 33(2) PCT).
- 3.1.2 The problem to be solved by the present invention may therefore be regarded as facilitating the assembly of the packing onto the valve member.
- 3.1.3 The solution proposed in claim 17 of the present application cannot be considered as involving an inventive step (Article 33(3) PCT) because the skilled person would obviously increase substantially the ratio D3/D1, without the exercise of inventive skill, in order to solve the problem posed.

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3.2 With reference to independent claim 24:

3.2.1 Document D1, which is considered to represent the most relevant state of the art, discloses a valve from which the subject-matter of claim 24 differs in that the ratio $H/D4$ is explicitly about 0.75 to about 0.85. The subject-matter of independent claim 24 is therefore novel (Article 33(2) PCT).

3.2.2 The problem to be solved by the present invention may therefore be regarded as reducing the packing volume.

3.2.3 The solution proposed in claim 24 of the present application cannot be considered as involving an inventive step (Article 33(3) PCT) because the skilled person would obviously decrease substantially the ratio $H/D4$, without the exercise of inventive skill, in order to solve the problem posed.

4. Dependent claims 2-13, 15-16, 18-23, 25-28 and 30 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step, the reasons being as follows:

4.1 With reference to dependent claims 2-13:

Claims 9 and 11-13 are known from D1. Claims 2 refers to a standard range of room temperature. Claims 3-8 refer to simple dimensional ratios that would be easily chosen by the skilled person without the exercise of inventive skill in order to facilitate the assembly of the packing on the valve member or to reduce packing material volume. Claim 10 refers to the use of obvious materials.

4.2 With reference to dependent claims 15 and 16:

Claims 15 and 16 refer to an obvious process method (claim 15) and a standard room temperature (claim 16).

4.3 With reference to dependent claims 18-23:

Claims 18-21 refer to obvious features. The features of claim 22 are known from

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D1. The features of claim 23 are known from D3.

4.4 With reference to dependent claims 25-28:

Claims 25 and 28 refer to obvious features. The features of claim 26 are known from D1. The features of claim 27 are known from D4.

4.5 With reference to dependent claim 30:

D1 discloses (cf. figure 4 and description, column 4, lines 27-37) a combination wherein the valve element comprises a ball (33) and stem (32) and with at least one trunnion (34) adjacent the ball.

5. With reference to claims 32-37:

5.1 The document D2 is regarded as being the closest prior art to the subject-matter of independent claim 32, and discloses (cf. fig.1):

A valve (10) comprising a valve body (12) having a valve cavity (14) therein; a valve element (20) for controlling flow through the valve based on rotational position of the valve element about an axis; and a packing (26) that surrounds the valve element and seals the valve element within the valve cavity; the valve element comprising a ball and adjacent upper (24) and lower (31) trunnions; the valve cavity being dimensioned to closely receive the valve element while permitting the valve element to axially shift to compensate for temperature effects on the packing.

5.2 The subject-matter of claim 32 therefore differs from this known valve in that:

The lower trunnion extends axially past a lower end of the packing.

5.3 The subject-matter of independent claim 32 is therefore novel (Article 33(2) PCT).

5.4 The problem to be solved by the present invention may therefore be regarded as avoiding creep of the packing material under the lower trunnion.

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- 5.5 The solution to this problem proposed in claim 32 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:
- 5.6 Such an arrangement is not obvious and is not suggested by the available prior art.
- 5.7 Claims 33-37 are dependent on claim 32 and as such also meet the requirements of the PCT with respect to novelty and inventive step.
6. The subject matter of claims 1-37 can be made or used in industry, and thus looked upon as being industrially applicable.

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CLAIMS

WE CLAIM:

1. A valve comprising:

a valve body having a valve cavity therein;

a valve element for controlling flow through the valve based on rotational position

- 5 of the valve element about an axis; and

a single piece packing that surrounds said valve element and seals said valve element within said valve cavity;

said single piece packing being dimensioned to be installed on said valve element within a room temperature range.

- 10 2. The valve of claim 1 wherein said room temperature range is about 65-100 °F.

3. The valve of claim 1 wherein said packing has a generally cylindrical outer surface defined by a height H and an outer diameter D4, said packing having a ratio H/D4 of about 0.75 to about 0.85.

4. The valve of claim 3 wherein said ratio H/D4 is about 0.8.

- 15 5. The valve of claim 1 wherein said valve element comprises a ball and adjacent upper and lower trunnions; said ball having an outer diameter D1 and at least one of said trunnions having an outer diameter D3; wherein said valve element has a ratio D3/D1 of about 0.7 to about 0.9.

6. The valve of claim 5 wherein said ratio D3/D1 is about 0.8.

- 20 7. The valve of claim 1 wherein said packing has a generally cylindrical outer surface defined by a height H and an outer diameter D4, said packing having a ratio H/D4 of about 0.75 to about 0.85; and wherein said valve element comprises a ball and adjacent upper and lower trunnions; said ball having an outer diameter D1 and at least one of said trunnions having an outer diameter D3; wherein said valve element has a ratio D3/D1 of about 0.7 to about 0.9.

8. The valve of claim 7 wherein said ratio H/D_4 is about 0.8 and said ratio D_3/D_1 is about 0.8.

9. The valve of claim 1 wherein said packing comprises a polymer.

5 10. The valve of claim 9 wherein said polymer is selected from the group comprising polytetrafluoroethylene (PTFE), polyethylene, polyetheretherketone (PEEK) and fluorinated ethylene propylene.

11. The valve of claim 1 wherein said valve element comprises a non-spherical flow control element.

10 12. The valve of claim 1 wherein said packing has an inner surface that forms an interference fit with said valve element when said packing is installed thereon prior to loading said packing within said valve body.

13. The valve element of claim 1 wherein said packing has an interference fit with said valve cavity when said packing is installed on said valve element and inserted into said valve
15 cavity prior to loading said packing within said valve cavity.

14. A method for assembling a valve comprising the steps of:
forming a one piece packing adapted to seal a valve element within a valve cavity; and
installing said packing onto said valve element within a temperature range for which
mechanical properties of the packing are substantially unchanged.

20 15. The method of claim 14 wherein said step of forming said packing comprises the step of machining said packing.

16. The method of claim 14 wherein said temperature range is selected so that the mechanical properties of the packing material are substantially unchanged as compared to the mechanical properties of the packing material at 70 °F.

25 17. A valve comprising:
a valve body having a valve cavity therein;

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a valve element for controlling flow through the valve based on rotational position of the valve element about an axis; and

a packing that surrounds said valve element and seals said valve element within said
5 valve cavity; and

said valve element comprising a ball and adjacent upper and lower trunnions; said ball having an outer diameter D1 and at least one of said trunnions having an outer diameter D3; wherein said valve element has a ratio D3/D1 of about 0.7 to about 0.9.

18. The valve of claim 17 wherein said packing has a generally cylindrical outer
10 surface defined by a height H and an outer diameter D4, said packing having a ratio H/D4 of about 0.75 to about 0.85.

19. The valve of claim 17 wherein said packing comprises a polymer that is selected from the group consisting of: PFA, filled PFA, polytetrafluoroethylene (PTFE), filled PTFE, polyethylene, polyetheretherketone (PEEK) and fluorinated ethylene propylene.

15 20. The valve of claim 17 wherein said packing is dimensioned to be installed on said valve element at a temperature below which said packing deforms.

21. The valve of claim 20 wherein said temperature is room temperature.

22. The valve of claim 17 wherein said packing is a single piece packing.

23. The valve of claim 17 wherein said packing is over molded onto said valve
20 element.

24. A valve comprising:

a valve body having a valve cavity therein;

a valve element for controlling flow through the valve based on rotational position of the valve element about an axis; and

25 a packing that surrounds said valve element and seals said valve element within said valve cavity; and

said valve element comprising a ball and adjacent upper and lower trunnions;

wherein said packing has a generally cylindrical outer surface defined by a height H and an outer diameter D4, said packing having a ratio H/D4 of about 0.75 to about 0.85.

5 25. The valve of claim 24 wherein said ball has an outer diameter D1 and at least one of said trunnions has an outer diameter D3; wherein said valve element has a ratio D3/D1 of about 0.7 to about 0.9.

26. The valve of claim 24 wherein said packing is a single piece packing.

27. The valve of claim 24 wherein said packing is a multi-piece packing.

10 28. The valve of claim 24 wherein said packing is installed onto said valve element at room temperature.

29. In combination, a valve element and a single piece packing therefore, wherein said packing is installed onto said valve element at room temperature.

15 30. The combination of claim 29 wherein said valve element comprises a ball and stem and with at least one trunnion adjacent said ball.

31. A valve comprising:

a valve body having a valve cavity therein;

a valve element for controlling flow through the valve based on rotational position of the valve element about an axis; and

20 a packing that surrounds said valve element and seals said valve element within said valve cavity;

said valve element comprising a ball and adjacent upper and lower trunnions; said ball having an outer diameter D1 and at least one of said trunnions having an outer diameter D3; wherein said valve element has a ratio D3/D1 that facilitates assembly of said packing onto said
25 valve element at room temperature.

32. A valve comprising:

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a valve body [21] having a valve cavity [20] therein;

a valve element [22] for controlling flow through the valve based on rotational position of the valve element about an axis [X]; and

5 a packing [32] that surrounds said valve element and seals said valve element within said valve cavity [20]; characterized by:

said valve element [22] comprising a ball [24] and adjacent upper and lower trunnions [28, 30]; said lower trunnion [30] extending axially past a lower end [32a] of said packing; said valve cavity being dimensioned to closely receive said valve element while permitting said valve
10 element to axially shift to compensate for temperature effects on said packing.

33. The valve of claim 32 wherein said valve cavity comprises a reduced diameter bore [40] that receives said lower trunnion [30] and prevents packing material from creeping below said lower trunnion.

34. The valve of claim 32 wherein said packing is live loaded.

15 35. The valve of claim 32 wherein said packing comprises a plastic polymer.

36. The valve of claim 35 wherein said polymer comprises PTFE.

37. The valve of claim 32 wherein said packing has a generally cylindrical outer surface defined by a height H and an outer diameter D4, said packing having a ratio H/D4 of about 0.75 to about 0.85

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